Published
Louis Caruana, "God's Eternity and Einstein's Special Theory of Relativity", *Revista Portuguesa de Filosofia* 61 (2005), pp. 89-112.

God's Eternity and Einstein's Special Theory of Relativity.

Louis Caruana, S.J.

Abstract

Max Jammer has recently proposed a model of God's eternity based on the special theory of relativity, offering it as an example of how theologians should take into account what physicists say about the world. I start evaluating this proposal by a quick look at the classic Boethius-Aquinas model of divine eternity. The major objection I advance against Jammer refers to Einstein's subtle kind of realism. I offer various reasons to show that Einstein's realism was minimal. Moreover, even this minimal realism has been undermined by recent experimental work. If Jammer is suggesting that theologians should take Einstein's physics seriously because it describes the world, his argument is unconvincing because it doesn't address the crucial question of Einstein's realism, which makes all the difference.

The year 2005 marks the centenary from the publication of Einstein's 1905 paper on special relativity entitled 'Zur Elektrodynamik bewegter Körper'. A previous centenary was celebrated in 1979. Various papers were then published to mark his birth, 14 March 1879, and honour his achievements in his American home, the Institute of Advanced Study, Princeton University. There he had worked and lived from 1933 till his death in 1955. One of these papers, written by Ernst Nagel, highlights the originality and cultural impact of Einstein's theory of relativity.[1] Many scholars have insisted that scientific theories are never isolated from the cultural milieu within which they are situated. Nagel writes: 'theories that have been notably fruitful in the natural sciences have also been repeatedly used for ideological purposes, to endorse or to condemn current social institutions and practices, to support or to oppose proposed changes in public policy, or to serve as a foundation for some philosophical or theological system.'[2] For Nagel, this constitutes a misuse of scientific theories. He recalls, for instance, a typical and well-known philosophical outcome of Einstein's theory of relativity, namely the work of Alfred North Whitehead. This is built on a

[1] Ernst Nagel, 'Relativity and Twentieth-Century Intellectual Life' in: Woolf, H. (ed.), *Some Strangeness in the Proportion: a Centennial Symposium to commemorate the Achievements of Albert Einstein*, Massachusetts: Addison-Wesley Publishing Co. Inc., 1980, pp. 38-45; Einstein's original paper was 'Zur Elektrodynamik bewegter Körper', *Annalen der Physik* 17 (1905), pp. 891-921, reprinted in Albert Einstein, *The Collected Papers of Albert Einstein*. Vol. 2, *The Swiss Years: Writings, 1900-1909*. Ed. by J. Stachel, D. Cassidy, D. Howard, et al., Princeton, N.J.: Princeton University Press, 1989, pp. 276-310.
[2] Ernst Nagel, 'Relativity and Twentieth-Century Intellectual Life', p. 38.

certain holism allegedly derived from Einstein. Holism here refers to the idea that the world has constituent parts (bodies, events, processes) with an intrinsic nature that depends on the relations that entity has to all others. Nagel is not convinced that Einstein's theory implies such a philosophical doctrine. There is a danger of misusing Einstein's work to suit one's purpose. In this paper, I engage in an inquiry on some alleged impacts of the special theory of relativity on theological reflection. What Nagel did as regards general features of twentieth-century intellectual life, I would like to do as regards the particular case of the special theory of relativity and its implications for the understanding of God's eternity.

My point of departure is a recent study by Max Jammer on Einstein and religion.[3] This impressive work has drawn attention to the way the special theory of relativity has played an interesting role in the on-going debate on how best to portray God's eternity. Many scholars have found the theory a rich source of inspiration. In broad outline, Jammer claims that this theory offers the best available model for the correct understanding of eternity. He goes on to lament that philosophers and theologians working in this area do not seem aware how important it is to keep up to date on what physicists have to say about time. He highlights this point by quoting a rhetorical question made by William L. Craig with which he is in full agreement: 'how can one pretend to formulate an adequate doctrine of God's eternity and His relationship to time without taking cognizance of what modern philosophy and science have to say about time?'[4]

In this paper I present some arguments that undermine, to some extent, Jammer's claim. I will not argue that there are intrinsic mistakes in the mathematical model he presents to account for eternity. My argument will focus rather on the importance he attaches to this model, an importance that, as I will show, is exaggerated. The crucial question for my inquiry will be whether Einstein was a realist. The kind of realism he endorsed, in so far as it can be called realism at all, makes a difference to what philosophers and theologians should do with ideas derived from the special theory of relativity. I will proceed in three sections. The first will be dedicated to an overview of the main arguments related to God's eternity. In the second, I will present Jammer's argument in some detail, and then, in the following section, I will engage in an evaluation, alluding primarily to the kind of realism endorsed by Einstein. The inquiry is motivated by the idea that Einstein's views on what theories can tell us about the world are very relevant for theologians who seek argumentative support from the special theory of relativity.

1. Previous models of eternity

Attempts to understand God's eternity are all related to time. Some may want to describe eternity as a state that transcends time, or as a state that corresponds to time without the distinction between past, present and future. One of the great challenges in this debate concerns the question of compatibility between, on the one hand, taking God's eternity to mean a state of timelessness, and, on the other hand, taking God's action to be something real for us temporal creatures. How can God act, in the sense of doing something with a beginning and an end, if He is timeless? To appreciate the impact of Einstein's special theory of relativity on this debate, it is important to understand, at least in broad outline, some of the major arguments presented in the

[3] Jammer, M., *Einstein and Religion*, Princeton University Press, 1999.
[4] W.L. Craig, 'God and Real Time', *Religious Studies* 26 (1990): 335-347, quoted in Jammer p. 176.

course of history.

I start with some models of eternity that can accommodate God's action. They are models that consider eternity in terms of timelessness. Consider, for instance, some key elements of Boethius' famous discussion on eternity in his two works *The Consolation of Philosophy* and the *De Trinitate*. He writes:

> Let us therefore consider what eternity is, for this declares to us both the divine nature and knowledge. Eternity then is the perfect possession altogether and all at once of boundless life (*aeternitas est interminabilis vitae tota simul et, perfecta possessio*)....That then which grasps and holds the fullness of boundless life all together, from which nothing future is absent and from which nothing past has escaped, is worthy to be accounted eternal. This must ever stand at and fully possess in an abiding present the infinity of changing time.[5]
>
> Our 'now' makes time and sempiternity, as it were running along; but the divine now, remaining, and not moving, and standing still makes eternity.[6]

The suggestion that 'eternity is the complete possession all at once of boundless life' has had widespread influence in subsequent generations of thinkers. Its richness can be appreciated by highlighting the following four points. Firstly, there is the idea that whatever is eternal has life. This is in sharp contrast to notions of eternity derived from mathematical truths that often seem to constitute the only model available for our understanding of eternity. Secondly, there is the concept of boundlessness of such a life expressed by the term *interminablis vitae*. This can be interpreted either as involving infinite duration without beginning or end, or as expressing the superior quality of this life when compared to the life we know in time. Thirdly, we may recognise within the definition a tension between, on one hand, an insistence on duration within eternity and, on the other hand, an insistence on the very special nature of such a duration *all at once*. Finally, I would like to highlight the idea of simultaneity, expressed by the phrase '*tota simul*'. This attribute of eternity will be crucial for later developments of the discussion. These four points constitute the main characteristics of Boethius' model. He uses the above ideas primarily to solve the problems that emerge when the freedom of the human individual is seen as incompatible with God's foreknowledge of events. The richness of Boethius' compact definition of eternity allows interesting solutions to this problem about freedom. The question, however, of whether a timeless God could be said to act at all is not addressed directly.

As distinct from Boethius, St. Thomas Aquinas attempts not just a definition, or, as I'm using the term here, a model that guarantees compatibility between God's omniscience and human freedom. Aquinas proposes a model that is essentially the result of a logical derivation that God is timeless. His argument therefore is stronger.

---

[5] 'Quid sit igitur aeternitas, consideremus. Haec enim naturam nobis pariter divinam, scientiamque patefecerit. Aeternitas igitur est, interminabiis vitae tota simul et perfecta possessio [...] Quod igitur interminabilis viate plenitudinem totam pariter comprehendit, ac possidet, cui neque futuri quidquam absit, nec praeteriti fluxerit, id aeternum esse jura perhibetur: idque necesse est, et sui compos praesens sibi semper assistere, et infinitatem mobisi temporis habere praesentem.' Boetius, *De consolatio philosophiae*, Book 5, prose 6, in: *Patrologiae Latinae*, volume LXIII, ed. J. Migne, Paris: 1860, pp. 858-9.

[6] 'Nostram nunc quasi currens tempus facit et sempiternum; divinum vero nunc permanens, neque movens sese atque consistens, aeternitas facit.' Boetius, *Quomodo Trinitatas Unus Deus*, chapter 4, in: *Patrologiae Latinae*, volume LXIV, ed. J. Migne, Paris: 1860, p. 1253.

Let us consider, for instance, those parts of the *Summa Theologiae* dealing with God's perfection, His creation, and His divine government. Question 9, dealing with the nature of God, includes a clear indication that, for Aquinas, the central issue, the starting point if you like, is God's perfection:

> Anything in change acquires something through its change, attaining something previously not attained. Now God, being limitless and embracing within himself the whole fullness of perfection of all existence cannot acquire anything, nor can he move out towards something previously not attained.[7]

There is a deductive line of reasoning here. The idea that God is timeless is derived from the fact of His unchangeableness and this, in turn, is derived from the fact of God's embracing within himself all perfection. For Aquinas, this fundamental attribute is equivalent to simplicity. God is simple in the sense that He has no parts. The conclusion that God is timeless is necessary, therefore, because of the deductive nature of the reasoning involved. Showing that it is necessary, however, contributes little as regards accounting for the innumerable time-dependent notions about God present in Scripture, Tradition and Liturgy. So Aquinas expands the discussion and makes a significant contribution to Boethius' model by introducing crucial semantic considerations. He starts with the two familiar elements:

> Two things characterise eternity. First, anything existing in eternity is unending, that is to say, lacks both beginning and end (for both may be regarded as ends). Secondly, eternity itself lacks successiveness, existing as an instantaneous whole.[8]

To this he makes valuable additions of a semantic kind. Consider, for instance, some further sections from Question 10, articles 1 and 2:

> (a) Just as Scripture describes God metaphorically in bodily terms, although he is not a body, so it describes eternity in temporal and successive terms although eternity exists instantaneously.[9]
>
> (b) We often use negations to define simple things, as when we say that a point has no parts. Now this is not because they are negative in their essential nature, but because our mind first of all grasps composite things, and cannot come to know simple things except by denying compositeness of them.[10]
>
> (c) Eternity and God are the same thing. So calling him eternal does not imply his being measured by something extrinsic; the notion of measurement arises only in our way of conceiving the situation.[11]

---

[7] 'Quia omne quod movetur, motu suo aliquid acquirit, et pertingit ad illud ad quod prius non pertingebat. Deus autem, cum sit infinitus, comprehendens in se omnem plenitudinem perfectionis totius esse, non potest aliquid acquirere, nec extendere se in qliquid ad quod prius non pertingebat' Thomas Aquinas, *Summa Theologiae*, 1, Q 9, art. 1, London: Blackfriars, 1964, henceforth abbreviated as *S.T.*1, Q 9, art. 1).

[8] 'Sic ergo ex duobus notificarus aeternitas. Primo, ex hoc quod id quod est in aeternitate est interminabile, idest principio et fine carens (ut *terminus* ad utrumque referatur). Secundo, per hoc quod ipsa aeternitas successione caret, tota simul existens' (*S.T.* 1, Q 10, art. 1).

[9] 'Sicut Deus, cum sit incorporeus, nominibus reurm corporalium metaphorice in Scripturis nominatur, sic aeternitas, tota simul existens, nominibus termporalibus successivis' (*S.T.* 1, Q 10, art 1).

[10] 'Simplicia consueverunt per negationem definiri, sicut punctus est *cuius pars non est*. Quod non ideo est, quod negatio sit de essentia eorum: sed quia intellectus noster, qui primo apprehendit composita, in cognitionem simplcium pervenire non potest, nisi per remotionem compositionis' (*S.T.* 1, Q. 10, art 2).

[11] 'Aeternitas non est aliud quam ipse Deus. Unde non dicitur Deus aeternus, quasi sit aliquo modo mensuratus; sed accipitur ibi ratio mensurae secundum apprehensionem nostram tantum' (*S.T.* 1, Q. 10, art 2).

> (d) Verbs of different tenses are used of God, not as though he varied from present to past to future, but because his eternity comprehends all phases of time.[12]

The basic idea is clear. In trying to discuss eternity, the models that are available to us are those expressible in our time-impregnated language. It is essential that we be aware of this. Aquinas, however, doesn't consider this limitation in our conceptual abilities as a block to attaining a genuine understanding of eternity. Metaphor and analogy are efficient tools for extending language and make it point beyond itself, as it were, to a referent that lies essentially beyond anything we can experience.

I move on now to the other two areas of the *Summa* that are useful for our inquiry on eternity, namely the part on creation and the other on divine government. As regards the former, Question 45 includes valuable arguments on the apparent incompatibility between God's specific act of creation, on the one hand, and His eternity or immutability on the other. Aquinas claims that, since creation is a singular kind of action, the incompatibility is a trace of our human, limited way of understanding.

> Creation is not change, except according to a mode of understanding. For change means that the same something should be different now from what it was previously ... But in creation, by which the whole substance of a thing is produced, the same thing can be taken as different now and before only according to our way of understanding.[13]

The question of divine government is tackled in a similar way. This debate deals with how God sustains creatures in their existence through time, and it might be objected that the claim that God preserves something in existence, this being necessarily a temporally extended act, contradicts the claim that God is eternal. Aquinas replies by showing how this preserving action of God is in fact very close to His creative act, which, as mentioned above, is a singular sort of action. In Question 104, article l, he explains: 'the preservation of things by God is a continuation of that action whereby He gives existence, which action is without either motion or time'.[14] The thing to appreciate here is that the explanatory model of eternity endorsed by Aquinas depends on semantic considerations. He cannot avoid the use of temporally dependent notions like 'continuation' and 'giving existence'. And yet, he is aware of the way such temporal language can allow us to understand something that lies beyond our daily concepts of time and space.

There is a sense, then, in which a model of eternity, like the one proposed by Boethius and developed by Aquinas, does offer us some understanding of this divine attribute in spite of the limitations of language. One particular aspect I want to highlight is that the model uses what is more accessible, such as temporally dependent notions, as a springboard to arrive at what is less accessible. The value of the model, as it were, lies in the way it enables even the uneducated to reflect on their own experience of the use of words and to engage in the intellectual journey to grasp something higher.

---

[12] 'Verba diversorum temporum attribuuntur Deo, inquantum eius aeternitas omnia tempora includit: non quod ipse varietur per praesens, praeteritum et futurum' (*S.T.* 1, Q. 10, art 2).

[13] 'Creatio non est mutatio nisi secundum modum intelligendi tantum. Nam de ratione mutationis est, quod aliquid idem se habeat aliter nunc et prius ... Sed in creatione, per quam producitur tota substantia rerum, non potest accipi aliquid idem aliter se habens nunc et prius, nisi secundum intellectum tantum' (*S.T.* 1, Q. 45, art. 2).

[14] 'Conservatio rerum a Deo nonest per aliquam novam actionem; sed per continuationem actionis qua dat esse, quae quidem actio est sine motu et tempore' (*S.T.* 1, Q. 104, art. 1).

One can foresee an objection here in the form of a question: if the notion of action is essentially temporal, and that of God's eternity is essentially timeless, as the model discussed so far seems to assume, isn't it the case that the two concepts will remain forever disjoint, even after stretching language, as it were, so as to denote beyond its limits? Such an objection has been advanced by Nelson Pike.[15] His detailed study of the whole problem includes an evaluation of the logical status of the proposition 'God is timeless', and also an investigation into the possible compatibility of this attribute of God with other things we usually affirm of Him, like immutability, immortality and omniscience. I will limit myself to his analysis of the conflict between timelessness and omnipotence, an analysis that touches on three key-elements: on the doctrine of omnipotence, on the doctrine of divine creation, and on the doctrine of divine preservation.

Considering omnipotence, he first uncovers what for him seems a serious difficulty in the traditional idea that God is omnipotent in the sense that He can do all things that are possible.[16] How can we ever understand this if we accept also the claim that God is incorporeal? Nothing that God can do, declares Pike, will count as riding a bike. Only beings with bodies can do that. Suppose we try to use some everyday activity of ours that resembles production without pre-existing material, without tools and without the need of a body. Could this work? The use of 'to create' in 'God created the world' might perhaps be modelled on the use of 'to conjure up' in the sentence 'Socrates conjured up a mental image'. Another attempt at approximating the meaning of 'to create' might be one inspired by the passages in Scripture about the Word of God. Perhaps the meaning of 'God created the world' is to be modelled on 'Socrates uttered a word'. Yet another possibility is to model 'to create' on the idea of sustaining the universe just like a singer can sustain the middle C for one minute. Pike insists that all these ways are inadequate. For instance, God's creation modelled on sustaining a note would imply that God's action is temporally co-extensive with the duration of the universe. There is no way around it. Hence such sustaining activity is not compatible with God's eternity. Whatever God's creation and God's action are modelled on, there must be some sort of beginning. This necessitates position in time, and hence incompatibility with eternity.[17]

The only legitimate reply, according to Pike, is to acknowledge the unfathomable distance between the meaning of some key-words when they are used as referring to us and when they are used as referring to God. To act, for us, means one thing. To act, for God, means a *completely* different thing. God's action should, therefore, be seen as creating, or bringing about, or affecting things in a specifically divine way. No models can help us here. When faced with a clash of true propositions about God, such as those concerning His action and His eternity, the tension should be defused by acknowledging our natural intellectual limitations. Pike, in fact, borrows from Friedrich Schleiermacher the idea of a combined notion of almighty-eternal.[18] Given that the concept of timelessness belongs to a static situation, while that of omnipotence to an infinitely dynamic one, we need to accept that these concepts are not two distinct

[15] Nelson Pike, *God and Timelessness*, London: Routledge & Kegan Paul, 1970.
[16] For instance, in *S.T.* Ia, Q25, 3.
[17] Nelson Pike, *God and Timelessness*, p.117.
[18] It seems to me that he is essentially adopting Schleiermacher's way of reasoning in *Der christiliche Glaube*; e.g. about eternity, Schleiermacher writes: 'Die Ewigkeit Gottes ist nur verstehen als allmächtige Ewigkeit, d.h. als das mit allem zeitlichen auch die Zeit selbst bedingende in Gott', *Der christiliche Glaube*, (herausgegeben von H. Peiter), Teilband 1, Walter de Gruyter, Berlin, 1980, §66, p. 195.

ones at all. They should be seen, according to Pike, as a highly complex unified attribute of God. Instead of saying that God is eternal and also that He is almighty, we should say, rather, that He is almighty-eternal. Thus, if this reading of Pike is correct, we are saving both timelessness and omnipotence, without having to account for the conceptual collision. God will take care of that.

On the surface, this objection exemplified by Pike's arguments, may seem to constitute a serious threat to the classic Boethius-Aquinas model. It seems to imply that God's eternity is unintelligible in itself as an attribute, and that we are obliged to accept the fact that, as far as we can see, God covers up various logical contradictions. There is, however, no such threat. The entire point of the semantic dimension of the debate, added by Aquinas, was precisely to show how our understanding of eternity is in line with how our intelligence normally functions. Our intelligence has access to abstract concepts only through the aid of concrete situations, which function, as it were, like a conceptual ladder. This climbing up of our understanding happens all the time, in so far as models, metaphors and analogies very often form part of our everyday explanations. Pike's arguments exhibit a considerable degree of artificiality because they bring together propositions uprooted from their semantic context. He never refers to the way our understanding moves from a simple situation to a complex one.

The objection to the Boethius-Aquinas model exemplified by Pike is not the only one. A more serious objector might want to see whether the *tota simul* character of eternity is self-consistent. Richard Swinburne has advanced various arguments of this kind. He starts by brushing aside the idea that eternity may perhaps be understandable in terms of everlastingness. He blocks this option by holding that if God is seen as enjoying everlasting duration and also immutability, He must have fixed his intentions 'from all eternity', as we sometimes say. This, however, would render Him 'a very lifeless thing; not a person who reacts to men with sympathy or anger, pardon or chastening because he chooses to, there and then.'[19] The thing to observe here is the appeal that Swinburne makes to the Biblical passages that talk about God. He considers these as normative, and yet falls short of making any serious attempt at following Aquinas' reasoning about the role of metaphor and analogy. Surprisingly, he remains at a superficial level when it comes to semantic considerations. For instance, he bluntly affirms that, if an agent forgives or understands, he must do it in time, and 'too many appeals to analogical senses of words would make sentences in which the words were used empty of content.'[20] This is hardly a recognition of the richness involved in the use of words in language, let alone a good appreciation and analysis of it. This point, therefore, doesn't cause much trouble for defenders of the Boethius-Aquinas proposal. What does cause trouble, however, as I see things, is his argument concerning simultaneity. If God's present embraces all our temporal sequence, doesn't that imply that the distinction between past, present and future is illusory? Recall that, according to the Boethius-Aquinas model, the present moment is possessed by God in His eternity not in a sequence but together with all the moments that for us were present before it and with those that will be present for us after it. The problem arises because, if one event E_1 is simultaneously possessed by God with another event E_2, we seem obliged to conclude that E_1 is simultaneous with E_2. This essentially means that the entire concept of time crumbles down. In Swinburne's words, 'yesterday would be the same as today and as tomorrow — which is clearly non-

[19] Richard Swinburne, *The Coherence of Theism*, Oxford: Oxford University Press 1977, p.2l4.
[20] *Ibid*. p.222.

sense.'[21]

This is the point where Einstein's theory of relativity might be invoked, because, as is well known, the concept of simultaneity features a lot in it. Can Einstein's novel ideas throw some light on the feasibility of the Boethius-Aquinas model? One way of replying in the affirmative was proposed by E. Stump and N. Kretzmann who noticed that the source of Swinburne's confusion lies in the fact that the definition of eternity contains more than one kind of simultaneity relation.[22] Swinburne's objection does not distinguish between these. He proceeds as if there were only one kind of simultaneity relation involved. It is not difficult, however, to see that the Boethius-Aquinas model introduces two realms. On one side we have the world of time, on the other the world of eternity. There may be a simultaneity relation within the world of time, a simultaneity relation within the realm of eternity, and yet another simultaneity relation that crosses the boundary. Stump and Kretzmann distinguish these different types of simultaneity as follows: (1) T-simultaneity, describing how events may occur together within the realm of time; (2) E-simultaneity, corresponding to how events occur together within the realm of eternity, in the same eternal present; and (3) ET-simultaneity, describing how an event in the realm of time is simultaneous with another in the realm of eternity.

This distinction clarifies what is really involved in the classic phrase '*tota simul*'. What we have here is ET-simultaneity. It involves crossing the boundary between the two realms. Because of this, the kind of simultaneity we are dealing with cannot be taken to imply anything about the temporal relation existing between two events that are both within the temporal realm. The relation involved in T-simultaneity is transitive. This means that if E_1 is T-simultaneous with E_2, and E_2 is T-simultaneous with E_3, then E_1 is T-simultaneous with E_3. As opposed to this, the relation involved in ET-simultaneity is not transitive. Consider an example. A person views a landscape from a high point. If we know that she is seeing two cars moving on different roads down below, we cannot conclude anything about whether passengers in one car can see the other car. Perhaps they can, perhaps they can't. The relation 'is within the visual field of' cannot be carried over from one view-point to another. It is not a transitive relation. This is the case as well with ET-simultaneity. If Stump and Kretzmann are right, therefore, the Boethius-Aquinas model of eternity is not vulnerable to Swinburne's attack.

Parenthetically, I may perhaps dwell a little on the role of metaphor and analogy in Stump and Kretzmann's proposal. It seems to me that some confusion may still lurk here precisely because metaphor and analogy are given only a marginal role. It might be objected against Stump and Kretzmann, in fact, that their proposal runs the risk of considering God's eternity a special kind of duration, the special thing about it being that it is a duration precisely without temporal sequence. Saying this in such a blunt way would obviously mean trouble. The risk arises because calling God's mode of existence a duration will inevitably contaminate the concept of eternity with a strong element of temporal sequence. Hence, saying that God's eternity is both an absolutely timeless existence and also simultaneous with all moments of our temporal existence, without referring to analogy or metaphor, risks reopening the door to confusion. I do not advance this simple argument as a decisive objection to Stump and

[21] *Ibid.*, p. 221.

[22] E. Stump, and N. Kretzmann, 'Eternity', *Journal of Philosophy* 78 (1981) 429-458; see also their 'Atemporal duration' *Journal of Philosophy* 84 (1987), 214-219, where they offer replies to various criticisms.

Kretzmann, as some commentators do.[23] My aim is to draw attention to the fact that disregarding the importance of semantic considerations sets our expectations on the wrong track. It makes us want a concept of eternity that lies within, rather than beyond, our linguistic domain. This, as I mentioned at the very beginning, is a temptation to be resisted. Boethius himself, so many centuries before the 1905 special theory of relativity, had already made it clear that our 'now' constitutes time, as it were running along; but the divine now lies beyond this. We must always remain aware of the fact that the key-words in this debate are not being used in the same way when applied to God and when they are applied to us.

I will close the parenthesis here. This is certainly not because this argument is irrelevant but because the point I want to highlight is the application of Einstein's special theory of relativity within the domain of theological discourse. Stump and Kretzmann's paper stands out as the first attempt. A more direct and ambitious attempt is that of Max Jammer.

2. Jammer's relativity model

This model forms part of Jammer's book *Einstein and Religion*. It is important to mention that the discussion on eternity forms only a small part of a long presentation consisting of three chapters, the first on Einstein's religiosity and the role of religion in his private life, the second on Einstein's philosophy of religion, and the third on the impact of his work on theology. The overall aim may be described as a step by step reconstruction of Einstein's idea of a cosmic religion and of an impersonal God very similar to the God of Baruch Spinoza.

There is little doubt in Jammer's mind about the considerable significance Einstein's physics has for theologians. In his third chapter he sets himself the preliminary task of convincing the reader that drawing theological consequences from physics has had a long history. The two most spectacular books that exhibit how science can have long-term theological consequences in western culture are, according to him. those of Isaac Newton and William Paley. Newton's *Principia Mathematica* contains the intriguing identification of absolute space with God's omnipresence and the corresponding identification of absolute time with God's eternity. Paley's *Natural Theology* defends the view that the material world as revealed by science is a sign of God's intelligence in designing it. Both lie at the junction between natural science and theology.

For Jammer, Einstein's theory of relativity should be seen as no less spectacular than these two major works as regards the interesting interface between science and theology. Because of this theory, previous notions of space and time, including Aristotle's classic one in his *Physics* Book III, had to be revised. Time is much more complicated than the numbering of movement in respect of the before and after. The basic novelty arises because there is a certain *relativity of temporal sequence* of two events that are causally inconnectable one to the other. In short, for two events e_1 and e_2, there may be different reference frames in which they are observed. For instance the former event may be something happening in a slowly moving car and the latter something happening in a fast moving car, both events being observed by an observer standing on the pavement. The theory entails that whether e_1 occurs before, simultaneously with, or after e_2 depends on the choice of the reference frame in which they

[23] For instance, Alan G. Padgett, 'Eternity and the Special Theory of Relativity', *International Philosophical Quarterly*, vol. 33 (1993), pp. 219-223.

are observed.

Jammer recalls how Einstein's 1905 paper takes up the challenge of resolving the contradiction arising from the clash between Galileo Galilei's relativity principle and James Clark Mawell's theory of electromagnetic waves. As a very plausible starting point, Galileo had taken the idea that the laws of physics are the same in all inertial reference frames. In this context, the term 'inertial' is used to indicate uniform motion as opposed to accelerated motion. This means that, in the simple example mentioned above, what happens in the slow moving car should not be considered determined by laws that differ from those determining what happens in the fast moving car. As distinct from this, Maxwell's theory required that the velocity of light in a vacuum be the same in all inertial frames. Maxwell's surprising claim was confirmed by experiment about 17 years before the publication of Einstein's paper. The utter incompatibility between these two scientific results is not difficult to see. Light travelling in a slow moving car and light travelling in a fast moving car should be observed as having *different* velocity if the laws governing the propagation of light are the same for both reference frames. Einstein resolves the puzzle by shifting a foundational building block that, in the long debate, had always remained intact in the background, assumed untouchable, namely the doctrine of absolute time. He showed that the contradiction is resolved if time is taken to be relative to the reference frame.[24]

To redefine time, Einstein starts his inquiry at the point where less difficulty is expected. He starts with the relativity of simultaneity, and then generalises for other aspects of time. As regards simultaneity, he shows that the reference frame makes a difference. Two events that are simultaneous when observed from some particular reference frame can no longer be considered simultaneous when observed from another reference frame moving relative to the first. For an interesting illustration of this point, one may consider a moving train hit by two lightening strokes that are simultaneous with reference to the embankment but turn out to be non-simultaneous with respect to the train. If simultaneity is dependent on the reference frame, so will time in general be also. Einstein's definition of time uses simultaneity as a basic concept:

> Thus with the help of certain imaginary physical experiments we have settled what is to be understood by synchronous stationary clocks located at different places, and have evidently obtained a definition of 'simultaneous', or 'synchronous', and of 'time'. The 'time' of an event is that which is given simultaneously with the event by a stationary clock located at the place of the event, this clock being synchronous, and indeed synchronous for all determinations, with a specified stationary clock.[25]

From here, Jammer proceeds by claiming that 'theologians and philosophers do not seem to know that the special theory of relativity itself, by means of its space-time geometrical diagrams, offers perhaps the best representation of the eternity-time rela-

[24] The full significance of the crucial Michelson-Morley experiment as regards the intellectual development leading up to the Special Theory of Relativity is discussed in Silvio Bergia, 'Einstein and the Birth of Special Relativity' in: A.P. French (ed.), *Einstein: a Centenary Volume*, Cambridge Mass.: Harvard University Press, 1979, pp. 65-89. Einstein was more of a theoretical physicist than an experimental one. His strategy may be considered a kind of re-axiomatisation: he re-evaluated the axioms that determined a particular theoretical system. This strategy is evident also in other fields of physics, for instance in John von Neumann's contributions to Quantum Mechanics: cf. Louis Caruana, 'John von Neumann's "Impossibility Proof" in a Historical Perspective', *Physis* 32 (1995), pp. 109-124.

[25] A. Einstein, 'On the electrodynamics of moving bodies' [an English translation of the Introduction and Part I of 'Zur Elektrodynamik bewegter Körper'], in: A.P. French (ed.), *Einstein: a Centenary Volume*, Cambridge Mass.: Harvard University Press, 1979, pp. 283-4.

tion'.[26] This proposal, I will argue, remains somewhat unconvincing.

I will first present an overview of his model. What he wants to show is that a point *E* can be shown to be simultaneous with all events that occur in a given temporal sequence. He uses a two-dimensional space-time representation in which *E* is the origin of reference frame *S*. He considers a specific world-line tracing a sequence of events. This world-line is chosen carefully by Jammer. It lies outside the light-cone of *E*, which means that any communication between any point on the world-line and *E* is impossible because it would require speeds greater than that of light. In spite of this, he wants to ensure that the velocity of the moving body so described is always less than the velocity of light. In other words, he wants to ensure that the world-line would indeed be a possible one. As is usual in such discussions, we use a simple two-dimensional space-time representation with *x* standing for distance and *T* for time, and we choose units so as to make the velocity of light equal to one. This means that the line at 45° passing through the origin (i.e. with gradient equal to one) represents the maximum velocity, that of light. Jammer suggests that, the world-line for his model can be a hyperbola. Consider the equation for this world-line suggested by Jammer:

$$T = \sqrt{(x^2 - {x_0}^2)}$$

where x_0 is a constant. *T* is defined for $x > x_0$ and has two values for each *x*. This equation is chosen by him with the express purpose of guaranteeing that, for $T > 0$, the gradient at any point is always greater than 1, and for $T < 0$, the gradient is always less than -1. This is so because

$$\frac{dT}{dx} = \frac{x}{\sqrt{(x^2 - {x_0}^2)}}$$

To simply matters, consider the case for $T > 0$ and $x > 0$, for which $x > \sqrt{x^2 - {x_0}^2}$ and hence $\frac{dT}{dx} > 1$ always. In other words, the infinite world-line is possible: an object having this world-line is never travelling with velocities greater than that of light, and yet never enters within *E*'s light-cone.

Some familiarity with the mathematical content of the special theory of relativity will enable one to understand also why the world-line Jammer chooses is one outside the future and past light-cones at *E*. Events within the future light-cone and within the past light-cone are causally linkable to *E*. Events outside these two light-cones are not. For such an event *P*, there is always an observer who can regard *P* as simultaneous with *E*. In the reference frame of this observer, call it *S′*, the two events *E* and *P* differ only in position, not in time. The reason for this is that, given the chosen world-line, the velocity of a moving frame such as *S′* with origin *P* outside the light-cones is less than that of light, and this means it is possible. As was done by Einstein in his 1905 paper, Jammer resorts to the Lorentz transformation to show how to relate the two reference frames *S* and *S′*. From here, *E* comes out to be simultaneous with *P*, where the term 'simultaneous' is employed with respect to the local inertial frame *S′*. Moreover, this simultaneity between *E* and *P* holds for all points like *P* on that world-line. In this way, therefore, Jammer has supplied us with a model of eternity in which a point is simultaneous with all events that occur in a temporal sequence.

What allows Jammer to construct this simple model is the peculiar novelty of

[26] Jammer p. 172.

Einstein's idea of spacetime. There is a radical difference between a simple combination of space and time in the pre-Einsteinian sense and the four-dimensional spacetime of the special theory of relativity. In the latter, space and time are just aspects of the one entity spacetime. What becomes fundamental is an *interval in spacetime*. Traditional spatial length and temporal interval thus suffer a radical shift in their explanatory role from fundamental concepts to *derived* ones. Moreover, the spacetime interval is multiply realisable, in the sense that for a given spacetime interval various traditional spatial lengths and traditional temporal intervals correspond legitimately. The variety results from the fact that these traditional concepts oblige us to choose a reference frame, and there are always more than one to choose from. Absolute simultaneity, therefore, is not conceivable in Einstein's spacetime. In other words, Einstein cannot hold that, given two mutually distant events, we can say that they are either simultaneous or not, irrespective of anything else. Simultaneity is a traditional notion corresponding to a temporal interval. This means that it depends on the choice of reference frame.

The model therefore is essentially an invitation to conceive of eternity as a point in spacetime, simultaneous with all events that occur in a well chosen temporal sequence of events. Just like Newton's *Principia*, and Paley's *Natural Theology*, Einstein 1905 paper on the special theory of relativity turns out to be another spectacular example of how theologians need to be up to date on what the scientists are doing. In the following section, I explore the validity of such a claim, and I start with the reasons that Jammer himself offers in favour of his relativity model.

3. Evaluation

Why should this model of eternity be considered better than that of previous generations? Jammer starts by arguing that it is better than the model offered by Stump and Kretzmann because, in his model, eternity is represented by a point rather than by a line. The relativity model therefore seems to capture the traditional idea of God's eternity having no extension, like a point, while the other model doesn't. This is Jammer's first argument in favour of his model. The second argument can be seen as a reply to those who might protest that the classical models are better than the relativity-model. According to Jammer, they aren't, the basic reason being that they do not result from up-to-date knowledge of what physicists have to say about the real world. As mentioned at the introduction to this paper, this argument is expressed by Jammer in the form of a lament. He asks: how can one pretend to formulate an adequate doctrine of God's eternity without taking cognisance of what modern science has to say about time? All models predating Stump and Kretzmann's are essentially outdated. The conclusion, therefore, is obvious: his relativity model is the more valuable one precisely because it incorporates into theological reflection the most recent findings of what physics has to say about time.

I want to argue that, although on the surface these arguments seem compelling, both of them have difficulties. I will consider each one in turn. The first will be dealt with quite rapidly. The second one will require more detailed analysis of what can legitimately be expected of the physics of time in any theological reflection about God's attributes.

As a first move, therefore let us consider the question: is Jammer justified in holding that the relativity model is better than the one proposed by Stump and Kretzmann? The crucial issue here is the image used for eternity. In the former model, eter-

nity is represented by a point, while in the latter by a line. Stump and Kretzmann had proposed an optical model in which there are two infinite horizontal lines.[27] The upper one is essentially a strip of light on which every point is visible, and therefore represents eternity. The lower line is a point of line moving along a straight line. This represents a moment of time, a set-up in which only one point at a time is visible. The eternal present therefore includes all time in the sense that each and every point on the line is illuminated simultaneously. Jammer's model is different because eternity is represented by a point rather than a line. It therefore seems more appropriate as a representation of one of God's attributes, in so far as God is in essence simple. Eternity therefore should involve some aspect of unextendedness.

My hesitation with his kind of reasoning originates at two points. First of all, Jammer himself acknowledges that considering eternity as a point is not an original element of his relativity model. He recalls that Boethius had described the relationship between time and eternity as that between a circle and its centre. Plotinus had conceived of eternity as a point towards which all lines converge.[28] So, it is true that Stump and Kretzmann diverge from this long tradition because they do not respect the unextended aspect of eternity. In this sense, Jammer is justified in holding that his relativity model is better than the one proposed by Stump and Kretzmann, at least as regards this issue. He remains however unconvincing as regards the absolute superiority of his relativity model when compared to classical ones. At best, what he can claim is that his relativity-model re-discovers an important aspect already evident in the classical models, and not that, as regards this particular issue, it is superior to theirs. The second source of some puzzlement lies in Jammer's neglect of Stump and Kretzmann's appeal to analogy. If they suggest that an optical metaphor may help, they are merely offering an aid to understanding. It would be a mistake to give to their light-line metaphor more importance than they intend. They write: 'although spatial metaphors for eternity or time are troublesome even whey they are helpful, it may be worth pointing out that both "the endless line" and "the unextended point" [...] strike us as providing more trouble than help'.[29] It seems that Jammer is erroneously equating two things. He seems to be equating, on the one hand, the distinction between the various forms of simultaneity involved in the eternity debate, which constitutes their model, with, on the other hand, the *image* they propose merely as an aid to explain ET-simultaneity. It is this ET-simultaneity that constitutes the explanatory core of their model, not the light-line.

If the arguments in these preceding paragraphs are correct, Jammer lacks justification for his claim that his relativity-model is better than the one proposed by Stump and Kretzmann. As I mentioned above, there is another argument Jammer wants to advance. He argues essentially that the relativity-model is better than all the others because they, as opposed to his, aren't the result of up-to-date knowledge of what physicists have to say about the real world. What he is essentially proposing here is not that science promotes religiosity or that science can induce a person to join a religious denomination. Rather, he is convinced that Einstein's 'purely scientific' work has implications that are relevant to theology as a systematic discipline. More specifically, he is in full agreement with those who have invoked some features of Einstein's special and general relativity to resolve theological problems, or to support

[27] Mentioned in their 'Atemporal duration' *Journal of Philosophy* 84 (1987), 214-219.
[28] Plotinus writes: '[eternity is] an indivisible perfection similar to a point, in which all [the lines] reunite, without ever going out again', *Enneads* III, 7, 3.
[29] 'Atemporal duration' *Journal of Philosophy* 84 (1987), p. 219.

or to refute certain religious theses.[30] To evaluate this second argument, some fundamental spade work needs to be done. What could 'taking physics seriously in theological discussion' mean? In theological discussions, are models from physics to be given more importance than they are given by physicists themselves in their own discipline? To start working towards a reply to these questions, we need to face the question of the kind of realism embraced by Einstein. I will draw from two important research papers written about Einstein's views on realism, one written by Gerald Holton in 1973, and the other written as a response to this by Don Howard twenty years later.[31]

The basic thrust of Holton's arguments can be said to be centred on the claim that Einstein experienced a gradual philosophical reorientation, essentially from being a positivist to being a realist. According to Holton, Einstein's early positivism is evident in various events during his formative years. For instance, he was in correspondence with one of the foremost chemist-philosophers of the day, Wilhelm Ostwald, who, like Ernst Mach, was a major critic of the mechanical interpretation of physical phenomena. Ostwald and Mach spearheaded a formidable research programme intent on the elimination of metaphysics. Holton inquires to what extent Einstein's relativity paper of 1905 was imbued with their style of thinking. He writes:

> In brief, the answer is that the Machist component — a strong component, even if not the whole story — shows up prominently in two related respects: first by Einstein's insistence from the beginning of his relativity paper that the fundamental problems of physics cannot be understood until an epistemological analysis is carried out, particularly so with respect to the meaning of the conceptions of space and time; and second, by Einstein's identification of reality with what is given by sensations, the 'events', rather than putting reality on a plane beyond or behind sense experience.[32]

This last observation, Holton admits, does indeed constitute a trend in Einstein's style, but perhaps not a general one. The positivists of the Vienna Circle were certainly glad that the special theory of relativity meant a victory over the metaphysics of absolute space and time. Apart from this, however, there are other trends in that very same paper showing how Einstein never really endorsed their entire programme. He never conceded that the ultimate building blocks of the world are merely elements of sensory experience, as the orthodox positivist doctrine requires. Holton, therefore, rightly proceeds by enlarging his investigation so as to include the Einstein-Mach correspondence, and, surely enough, a certain divergence between the views of these two correspondents becomes obvious. The clearest statement of this divergence is probably Einstein's 1922 comment quoted in the journal *Nature*: 'Mach's system studies the existing relations between data of experience: for Mach, science is the totality of these relations. That point of view is wrong, and in fact what Mach has done is to make a catalog, not a system'.[33]

Holton's inquiry continues with an attempt at describing Einstein's alleged pilgrimage towards a robust realism. I am calling robust realism here the position according to which there is an objective real world behind the phenomena to which our

---

[30] Jammer p. 161.

[31] G. Holton, 'Mach, Einstein and the search for reality,' (1968) reprinted in: *Thematic Origins of Scientific Thought: Kepler to Einstein.* Cambridge Mass.: Harvard University Press, 1973; Don Howard, 'Was Einstein really a realist?' *Perspectives on Science,* vol. 1 (1993), pp. 204-251; see also: Howard's paper 'Einstein and Duhem', *Synthese,* vol. 83 (1990) pp. 363-384.

[32] Holton p. 224.

[33] See: 'Einstein and the Philosophies of Kant and Mach,' *Nature*, vol. 112 (1923), p. 253.

senses are exposed. Some later comments by Einstein add considerable weight to Holton's claim. For instance, in 1931 Einstein wrote quite clearly that, as far as he was concerned then, the belief in the external world independent of the perceiving subject is the basis of all natural science. A clearer expression of robust realism can hardly be conceived. The basic claim defended by Holton, therefore, is that Einstein experienced an impressive shift from one end of the epistemological spectrum to the other. From Machian positivism, evident in his 1905 paper, he moved to the robust realism expressed in his general theory of relativity and in his dealings with the various proponents of the quantum theory.

This claim suffers from serious over-simplification. To show this, I will draw from the a historical study by D. Howard who has uncovered serious flaws in Holton's reasoning. Howard concedes that Einstein's story, as it has been sketched up to now, contains 'more than a little truth'.[34] Some interpretative moves, however, are severely misleading. The major point is that Einstein's philosophy cannot be divided into two neat periods. The issue is more nuanced than a simple shift from positivism to realism. Howard, in fact, introduces undeniable evidence for the claim that Einstein was a realist all along. There was no radical shift, because Einstein's position was neither pure positivism nor robust realism. His position was a constant kind of realism we may call minimal. He may be called a realist only in the sense that he was committed to the mind-independent character of a very specific set of physical principles. He was not a realist in any sense related to the interpretation of scientific theories, as is often understood by that term today. I will now examine some of the major arguments that Howard advances as justification for his claim.

The main difficulty is that, in the previous paper, Holton had failed to see beyond the simple pair of categories in vogue at the time of his writing. He faild to see beyond the mutually opposing categories of positivist and realist. Limiting the argument to these two possible categories neglects the complexity and variety of points of view prevalent in Einstein's day. In fact, Einstein, reflecting on his own long experience as a scientist, remarked in 1949 that the scientist is often somewhat difficult to classify in the clear categories of philosophy. Since the scientist's practice is essentially engaged with external conditions set by the facts of experience, the systematic philosopher is often disconcerted. The mature Einstein writes:

> [the scientist] must appear to the systematic epistemologist as a type of unscrupulous opportunist: he appears as *realist* insofar as he seeks to describe a world independent of the acts of perception; as *idealist* insofar as he looks upon the concepts and theories as free inventions of the human spirit (not logically derivable from what is empirically given); as *positivist* insofar as he considers his concepts and theories justified *only* to the extent to which they furnish a logical representation of relations among sensory experiences.[35]

Such a clear confession by Einstein offers considerable support to Howard's claim. Hence, if Einstein didn't endorse Mach's position, we cannot simply conclude that he endorsed the opposite one, as Holton seemed to have concluded in his previous paper. For instance, the fact that Einstein did not refute the reality of atoms, like Mach, doesn't mean that he considered himself free to add on to these atoms any extra properties other than those strictly necessary for the purpose at hand. In short, Einstein accepted an ontology of unobservables without sliding into the temptation of making

[34] D. Howard, 'Was Einstein really a realist?', p. 208.

[35] A. Einstein, 'Reply to criticisms', in: *Albert Einstein: Philosopher-Scientist*, ed. P.A. Schilpp, Evanston, Ill.: Library of Living Philosophers, 1949, p. 684.

this ontology richer than it need be.

This philosophical position is essentially a version of Duhemian holism. Pierre Duhem had shown that there is no such thing as a crucial experiment that can decide the truth or falsity of an entire theory.[36] Theories are tested as wholes and not piece by piece. If one piece is disconfirmed, we can either change the entire theory or make suitable changes in some of the theory's auxiliary hypotheses. What Einstein found very attractive in this Duhemian version seems to have been its acceptance of underdetermination without neglecting some role for deep theory. Howard's main contribution was to show that Einstein endorsed precisely such a refined philosophical position, and not a bland, late twentieth-century version of realism. Howard found striking evidence for this in the Einstein Archives at the Hebrew University of Jerusalem. Einstein has left us this important written comment:

> 'The physical world is real.' That is supposed to be the fundamental hypothesis. What does 'hypothesis' mean here? For me, a hypothesis is a statement, whose *truth* must be assumed for the moment, *but whose meaning must be raised above all ambiguity*. The above statement appears to me, however, to be, in itself, meaningless, as if one said: 'The physical world is cock-a-doodle-doo.' It appears to me that the 'real' is an intrinsically empty, meaningless category (pigeon hole), whose monstrous importance lies only in the fact that I can do certain things in it and not certain others. This division is, to be sure, not an *arbitrary* one ... I concede that the natural sciences concern the 'real', but I am still not a realist.[37]

What we have here is a clear confession that Einstein was not a realist in any straightforward sense. Trying to chart the nuances that were so important for him is essential. All in all, it appears that holism and underdetermination remained the two basic pillars of Einstein's writings about scientific methodology. He thus takes on board Duhem's opposition to the intrusion of empirically ungrounded, a priori metaphysics into science. To be sure, he does this not because he also endorsed Duhem's concern for doing so, namely the idea of articulating the clear distinction between faith and reason, and experimentation. He does it, one may say, simply because he thought it was the correct thing to do. The role he assigns to reality, as regards scientific practice, is indistinguishable from the driving force that keeps scientists going. He was clear that an indispensable assumption for physicists is that the real world exists independently of any act of perception. This assumption is not something we *know*, still less something we can prove or discover. It is just an indispensable premise of our global research programme.[38]

We have reached a point where one may demand some more precision. What is the content of such a minimal version of realism? I follow Howard in holding that the best way to describe this content is to refer to a set of principles. These are evident in what Einstein considered absolutely necessary to ensure 'holding on to physical reality'. Since his early work on the special theory of relativity and on Brownian motion, he had expressed his belief in the reality of atoms and in reality of the spacetime manifold. In discussing quantum mechanics later on, he refined his view. Holding on to reality began to mean for him holding on the very basic assumption that what is

---

[36] Most explicitly discussed in: P. Duhem, *La théorie physique: son objet, sa structure*, Paris: M. Rivière, 1914. This insight has been picked up by Willard van Orman Quine, cf.: 'Two Dogmas of Empiricism' in: *From a Logical Point of View*, Cambridge Mass.: Harvard University Press, 1953.

[37] Quoted in D. Howard, 'Was Einstein really a realist?', p. 225.

[38] See Howard p. 233.

present in different parts of space has an independent, real existence. What is present in a part *A* should somehow have an existence independent of what is present in another part *B*. Howard calls this Einstein's 'separability principle'. Different parts of the world are separate, at least in some sense. Till the end of his life, Einstein understood very well how deeply the quantum theory differed from anything that had been conceived before. It violated even the minimal requirement for realism, namely the principle of individuation for physical systems. As Howard shows, Einstein was convinced that the separability principle was the only way one can achieve a coherent conceptual framework for physics.[39] The original question I set myself was about the content of this kind of realism. Howard's development of Holton's arguments show clearly, I hope, that Einstein's realism was minimal in the following sense. It consisted only in these three assertions: (1) holism as regards theory-testing; (2) underdetermination of theory by data; (3) accepting at least the principle of separability. Stronger versions of realism were considered suspect by Einstein.

Where does this lead us as regards Jammer's maxim that we should take physics seriously in theological discussions? For sure, a lot depends on the word 'seriously'. It seems to imply a stronger dimension of the imperative. The enhanced obligation originates from the assumption that natural science is the only discipline that tells us how the world really is. As we have seen, however, this assumption has been the object of some doubts, even ridicule, by Einstein himself. There is certainly a mind-independent world in which one can do certain things and not others. As Einstein said, this division between what one can do and what one can't do isn't an arbitrary one. But that is all there is to his kind of realism. If we are to take Einstein's physics seriously in theological discussions, we need to take it seriously together with Einstein's kind of minimal realism in which it is embedded. Jammer seems to bypass this crucial point. He harps on about the importance for theology of Einstein's theories without mentioning Einstein's philosophical discretion as regards his own theories.

Moreover, it is easy to find reinforcement for this point when we recall that relatively recent experiments have provided very strong evidence undermining one of the basic building blocks of Einstein's minimal realism, namely his principle of separability. The verification of quantum-mechanical predictions have provided impressive evidence that spatially separated systems do not have their own states. On this matter there has been much discussion. The only area of interest for us here is the undermining of what Einstein considered indispensable. It might perhaps be objected that these experiments require careful interpretation. It might be said that they show the untenability of holding not the one principle of separability but rather the untenability of holding two principles together. More specifically, it shows the untenability of holding *both* the principle of separability and another principle, often called that of locality. This latter principle holds that, if *A* and *B* are spatially separated, then the state of *B* cannot be immediately affected by anything that is done to *A* alone.[40] Such an objection, however, involves a relatively recent conceptual refinement, and as such is not very relevant for my argument here. The point I want to highlight is that Ein-

[39] Howard differs from Arthur Fine who discusses Einstein's realism in his *The Shaky Game: Einstein, Realism, and the Quantum Theory*. Chicago: University of Chicago Press 1986. Fine is convinced that the minimal condition for Einstein's realism was determinism, rather than separability. In my view, Einstein's realism is better viewed as a combination of both these two theses.

[40] For a full treatment of this point see M. Redhead, *Incompleteness, Nonlocality and Realism*, Oxford: Clarendon, 1987.

stein's realism, even though minimal, has suffered considerable loss of credibility, and this arose not only from some philosophical quarters but also from various experimental results. If Jammer is suggesting that theologians should take Einstein's physics seriously *because* it is a set of theories that constitute the only way of describing the world, he is bypassing the crucial question of the status of Einstein's physics as regards the very idea of *describing* the world. The least we can say is that Jammer's claim needs revision to avoid being superficial and misleading.

Up to now, I have been concentrating on the issue of realism. There is another unconvincing aspect in Jammer's assumptions behind his way of reasoning. It concerns the very idea of explanation. The special theory of relativity is presented as an aid for the understanding of God's eternity. Jammer therefore is proposing a *model* for eternity. An important question to be addressed is whether this model is in fact helping us or hindering us in our desire to attain a genuine understanding of God's eternity. As regards models in general, there has been much research and discussion: the view I hold is one that I owe in its essentials to Mary Hesse. She starts with a useful distinction between material and formal models.[41] A material model essentially consists of physical entities, such as billiard-ball collisions in the context of discussing the behaviour of gases. A formal model is one that involves only symbols and equations, such as the wave-equation when used in the context of discussing the simple pendulum. There is a relation between a model and the world. It is the relation of analogy. In other words, models are relata of analogy relations. The relation between, say, gas particles and billiard balls is a *material* analogy, in so far as (1) the two kinds of entity involved as relata are taken to be mind-independent existents; and (2) some mechanical properties of gas particles and those of billiard balls are taken to be similar.

Analogy relations come in degrees. A material analogy is positive when two analogues have features that are identical or strongly similar. It is negative as regards those features of the two analogues that are different or strongly dissimilar. A neutral analogy picks out those features for which there is no indication yet as to similarity or dissimilarity. As is easily evident, it is precisely this area of neutral analogy that is so important for new inquiry and possible discovery of new attributes of the object of study. Moreover, the success of a model is gauged in terms not only of its facilitating predictions and of its fertility in the area of the neutral analogy it involves, but also by its accessibility. In a nutshell, the model needs to be more accessible than the object or situation it models. It is precisely this aspect that constitutes the utility of models. What would be the use of a model that is more complicated than the thing or situation it models?

If we apply these general considerations to Jammer's proposed relativity-model of God's eternity, we see that it leaves a lot to be desired as regards precisely this issue of accessibility. There are certainly many genuine physicists who can appreciate Minkowski spacetime geometry and thus may esteem also Jammer's model. These individuals, however, cannot be said to constitute the majority of people who are in search of some understanding of God's eternity. Apart from some relativity physicists, there are indeed many more people who seek an understanding of how God's eternity relates to their personal freedom, how it relates to the way prayers are genuinely expressed with the hope of being answered, how it relates to the way our

[41] Hesse, Mary, *Models and Analogies in Science* (Notre Dame, Indiana: University of Notre Dame Press 1966); 'Models and Analogies' in: *A Companion to the Philosophy of Science*, W.H. Newton-Smith (ed.), Oxford: Blackwell, 2000, pp. 299-307.

personal future involves our own responsibility and is not already determined, and so on. As physics evolves, the spacetime of relativity theory is becoming more and more remote from the space and time we think of as fundamental attributes of our immediate experience. Given this near dissociation between the two conceptions, one needs to face the question, in all honesty, whether it is wiser to propose models that are linked more to everyday life-experience, or models that are dependent on remote conceptions that often defy all possibility of material analogy. There are some guiding principles for facing this question. Certainly, one of them is the following. If the model is not simpler than the reality it models, or if it is itself accessible only with difficulty, in the sense that it needs another subsidiary model for it to be grasped, its value as an intellectual aid diminishes. One advantage of the phenomenological approach is that it supplies us with models that are 'ready to hand' rather than esoteric, remote or mathematically challenging. The Boethius-Aquinas model may suffer from some simplicity, but it has the merit of engaging many a reader in an intellectual itinerary that starts at home, as all itineraries are meant to start. This is evident, for instance, in its idea of perfect possession altogether and all at once of boundless life. We all experience life — eternity is a kind of super-life from which nothing future is absent and from which nothing past has escaped.

Conclusion

The consequence of these various arguments should now be clear. I started by concentrating the discussion on Jammer's double-sided proposal: that the relativity model is the best available model for the correct understanding of eternity; and that theologians should take into account what physics has to say about the world. I developed my argument in three sections. The first was essentially an overview of some arguments related to God's eternity presented in the course of history, from among whom I singled out the Boethius-Aquinas model. The second section was dedicated to Jammer's model, which basically consists in a world-line chosen so as to ensure that each point on it be simultaneous with one external point representing eternity. From here, I proceeded with an evaluation of Jammer's two claims. The first one was found questionable in the sense that the relativity model cannot be said to be the best just because it has eternity associated with a point rather than a line. Jammer's second claim was then evaluated via the crucial question: in theological discussions, are models from physics to be given more importance than they are given by physicists themselves in their own discipline? Einstein's own attitude towards the role of theory as regards describing the world became thus important for my argument. I gave various reasons to show that Einstein's realism was minimal in the sense that the basic point for him was accepting the principle of separability. This minimal content has itself been the object of considerable criticism arising from experimental work. My conclusion was that, if Jammer is suggesting that theologians should take Einstein's physics seriously *because* it is a set of theories that constitute the only way of describing the world, he is bypassing the crucial question of Einstein's realism, which makes all the difference. The fact that Einstein was a minimal realist undermines, to some extent, the value of Jammer's relativity-model of eternity. It casts doubts as well on any quick judgement regarding the relevance of Einstein's theories for theological reflection.

There are three important quotes from Einstein that capture his attitude very well. The first is his famous affirmation that 'science without religion is lame, religion

without science is blind'.[42] This shows that, for him, some kind of mutual interest and interaction between the two disciplines seemed indispensable. The second quote came as a reply to R.T. Davidson, Archbishop of Canterbury, when he asked Einstein what effect relativity would have on religion. Einstein replied, 'None. Relativity is a purely scientific matter and has nothing to do with religion.'[43] A claim more diametrically opposed to the first quote can hardly be conceived. The third is Einstein's paradoxical reply to those who once asked him to define his religion. He called himself a 'deeply religious non-believer'.[44] The point of the paradox originates from Einstein's use of the term 'non-believer' to refer to his refusal to belong to any institutional religion. These three quotations are like a frame within which Einstein's attitude is situated. He was neither a naive realist nor a naive scientologist seeking to substitute religion by esoteric science. Hence, for those who ask how relevant special relativity is for theology, the answer should be clear: only to a certain limited extent.

[42] A. Einstein, 'Science and Religion', *Conference on Science, Philosophy and Religion*, 1st, New York, 1940, pp. 209-214.
[43] Quoted in Jammer p. 155.
[44] Quoted in Jammer p. 157.